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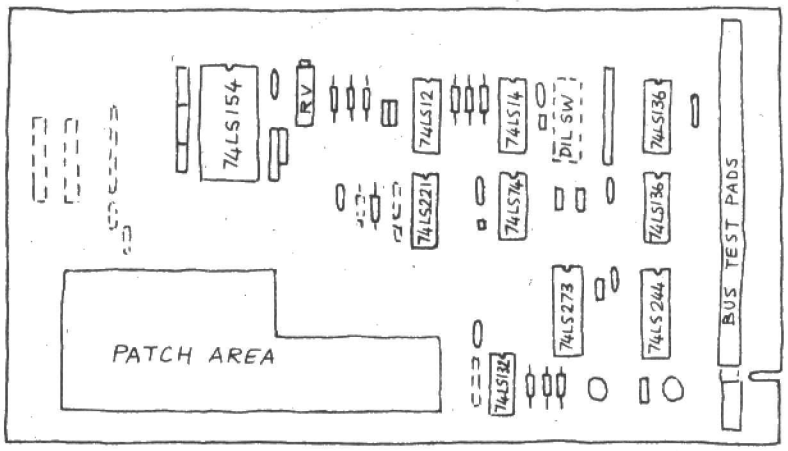
Greenbank Electronics
Telephone: 051-645 3391

Interak 1

KEYBOARD INTERFACE

Latched Parallel ASCII Keyboard Port



Latched Keyboard Port

FEATURES

* International Size Card (4.5" x 8").
* Suits Standard ASCII Keyboards.
* Keyboard data is latched on the card until read by microprocessor.
* Generous "patch" areas provided for user's own purposes.
* In most cases can replace the "Kemitron" DCR-6 card.
* For special purposes a 4K page decoder can be added to trigger a wait state monostable, and/or provide a page select to early "Kemitron" cards e.g. VDU-A,B,G.
* In normal use needs no memory space at all, data appears at one I/O Port.
* Can also be used for other than ASCII data in special applications (e.g. input of keypad data, or control switch matrix).
* I/O Port number is completely selectable by means of links or DIL switches.
* Plated-through holes, Epoxy-glass PCB.
* Green Solder Resist on "A" side.
* Gold-plated edge connector on both A and B sides.
* 5V only operation.
* -12V is routed to the keyboard connection area in case the user's keyboard requires -12V.
* ISBUS-A, INTERAK 1 bus compatible.
* KBUS-12 compatible.
* Buffered where necessary to reduce bus loading to 1 "LS" load per line.
* No manufacturer's name appears on the card, thus ideal for OEM use.

DESCRIPTION

The LKP-1 is the interface between the user's own ASCII encoded keyboard and the INTERAK 1 system. An extremely simple and easy to understand technique has been used in the past for reading the keyboard. In essence the ASCII data is connected to the lower seven data bits of the keyboard interface. The eighth bit carries the strobe from the keyboard to indicate that the ASCII data is valid. The microprocessor continually reads the Keyboard port and examines the strobe bit, taking the data when it is valid.

Although it is very easy to understand and implement the method described above, it does suffer some drawbacks, which are eliminated in the LKP-1 design. The first drawback is that it is very easy for the computer to miss a keystroke if it is involved in some other activity and is therefore not examining the keyboard port often enough. The second drawback is that a deliberate delay has to be built into some software authors' programs to avoid the same keystroke being read more than once.

The features of the LKP-1 card which deal with the two drawbacks of the earlier method are as follows: Firstly the ASCII data from the keyboard is latched on the card whenever the keyboard strobe indicates it is valid. Therefore there is no danger that the keystroke will be lost, no matter how busy the microprocessor is when the key is pressed. Secondly, the action of the microprocessor reading the Keyboard Port results in the latch being cleared to all zeros (ASCII "null"), so that the same data cannot be read again, and special precautions no longer need to be taken in the software to prevent this.

NON-INTERAK 1 USES

The circuit so far described is all that is necessary for this card to fulfill its function in an INTERAK 1 system. However, as there was some spare space on the card some extra circuitry was added to suit the needs of users of other systems, using for example early "Kemitron" cards.

In particular, the "Kemitron" equivalent of the VDU-K is a three card set known as VDU-A,B,G. The VDU-A,B,G set is not compatible with any of the buses used for this size of card. Also, the cards have decoding for only a 12-bit address, and so they need a 4K "page select" signal. A 74LS154 device is fitted on the LKP-1 card to provide this page select in such a system.

WAIT STATES

There is no need for any action to be taken on providing "wait" states for the LKP-1 card in its normal operation; it can cope easily with the Z80A timing for I/O transactions right up to the full 4.0 MHz CPU clock frequency.

The subject of "wait" states is relevant here, for another reason:

Normally there is no need for EPROM cards in the INTERAK 1 system, since it is predominantly RAM-based. As the RAM can work without wait states, at the full 4.0 MHz CPU clock frequency, then there is normally no need to slow the processor down at all. However, one of the features of the INTERAK 1 system is its modular nature, and the LKP-1 card could easily be used within an INTERAK 1 system which had a large complement of extra cards (e.g. EPROM programmer etc. etc.) which may need memory access "wait" states to be added. Or perhaps the LKP-1 card could be used in a very small dedicated application computer, where a single EPROM/RAM card would provide all the memory requirements. In both these examples, it may become necessary to incorporate "wait" states into certain of the memory accesses, especially those for the EPROMs, as they may be too slow for a Z80A running at its full 4.0 MHz.

The logically correct location for the "wait" state circuitry is for it to be provided on those individual cards for which "wait" states are required.

However, advantage has been taken of some spare space on the LKP-1 card, which would otherwise have been wasted, and the fact that track has been laid out for a 4K Page decoder to suit very early "Kemitron" cards (see "Non-Interak 1 Uses" above), to provide for an optional "wait" state on any of 3 chosen 4K pages in the memory map.

Another use for "wait" states, which is perfectly valid in an educational environment, is to use them purely as an example of the technique used, for the benefit of students learning about the Z80A. The appropriate waveforms can be displayed on an oscilloscope, and the action of the "wait" line demonstrated most clearly, by varying the duration of the monostable which requests the "wait" state(s).

General

All of the components used are readily available. The integrated circuits used are all laid out the same way round, which makes the card very straightforward to construct and test. Wherever possible signal tracks which have to pass between the legs of ICs are taken on the A-side so that they can be inspected in case of trouble. (Less considerate designers take them on the B-side where any shorts will be hidden under the IC sockets!) Plated-through hole construction is provided, and a solder resist mask on the A-side.

Although all of the signals are taken via the A-side of the 0.1" pitch edge connector (which is gold-plated) a gold-plated edge connector is also provided on the B-side.

CONTENTS OF KIT

The kit of components, which is sold separately to the p.c.b. itself includes 9 resistors, 2 SIL resistor packs, 1 variable resistor, 13 capacitors, 1 diode, 10 integrated circuits, 11 integrated circuit sockets (one of which is provided for an optional DIL selection switch), and some 0.1" pitch pin assemblies.

A 1" metal card front is recommended but is not included in the kit to keep the basic cost down for those working to limited budgets. Also excluded from the kit but required is a 20-way ribbon cable connector for the keyboard connection. (The connector has not been included because the exact type and style will depend on the user's wishes, and whether or not a front panel is fitted.) A further option is a DIL switch, which can be used for altering the port address quickly if required, however most users will not require to change the address once it is set, and thus will not be able to justify so easily the cost of providing this component.